

STATE OF CALIFORNIA  
Budget Change Proposal - Cover Sheet  
DF-46 (REV 08/15)

Cal Year 2016/17	Business Unit 3360	Department California Energy Commission	Priority No.
Budget Request Name 3360-014-BCP-DP-2016-GE		Program DEVELOPMENT	Subprogram RESEARCH AND DEVELOPMENT

Budget Request Description  
Climate Change Research, Development and Demonstration for California's Transportation Sector

Budget Request Summary

This proposal requests approval for one-time expenditure authority for \$15 million from the General Fund to support research to reduce petroleum use, drive greenhouse gas reductions, and improve air quality from California's transportation sector. The funding supports the Global Warming Solutions Act of 2006 (Núñez, Chapter 488, Statutes of 2006); Executive Order S-3-05; Governor Brown's Executive Orders B-16-2012, B-30-2015, and B-32-2015; and the Federal Clean Air Act.

Requires Legislation

☐ Yes ☒ No

Code Section(s) to be Added/Amended/Repealed

Does this BCP contain information technology (IT) components? ☐ Yes ☒ No

If yes, departmental Chief Information Officer must sign.

Department CIO

Date

For IT requests, specify the date a Special Project Report (SPR) or Feasibility Study Report (FSR) was approved by the Department of Technology, or previously by the Department of Finance.

☐ FSR ☐ SPR

Project No.

Date:

If proposal affects another department, does other department concur with proposal? ☐ Yes ☐ No

Attach comments of affected department, signed and dated by the department director or designee.

Prepared By

Date

Reviewed By

Date

Department Director

Date

Agency Secretary

Date

Department of Finance Use Only

Additional Review: ☐ Capital Outlay ☐ ITCU ☐ FSCU ☐ OSAE ☐ CALSTARS ☐ Dept. of Technology

BCP Type:

☐ Policy

☐ Workload Budget per Government Code 13308.05

PPBA

Original Signed By:  
Ellen Moratti

Date submitted to the Legislature

## BCP Fiscal Detail Sheet

BCP Title: Climate Change Technology Research

DP Name: 3360-014-BCP-DP-2016-GB

### Budget Request Summary

FY16

CY	BY	BY+1	BY+2	BY+3	BY+4
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Operating Expenses and Equipment

5340 - Consulting and Professional Services -

**Total Operating Expenses and Equipment**

**Total Budget Request**

0	15,000	0	0	0	0
<b>\$0</b>	<b>\$15,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>\$0</b>	<b>\$15,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>

### Fund Summary

Fund Source - State Operations

0001 - General Fund

**Total State Operations Expenditures**

**Total All Funds**

0	15,000	0	0	0	0
<b>\$0</b>	<b>\$15,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
<b>\$0</b>	<b>\$15,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>

### Program Summary

Program Funding

2390019 - Research and Development

**Total All Programs**

0	15,000	0	0	0	0
<b>\$0</b>	<b>\$15,000</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>

## Analysis of Problem

### A. Budget Request Summary

This proposal requests approval for one-time expenditure authority for \$15 million from the General Fund to support research projects focused in key areas that will assist the state in meeting its petroleum reduction goals. The state has set climate goals in the Global Warming Solutions Act of 2006 (Núñez, Chapter 488, Statutes of 2006) that cap economy-wide California greenhouse gas emissions at 1990 levels by 2020, and in Executive Order S-3-05 and Governor Brown's Executive Order B-16-2012, which call for reductions in greenhouse gas emissions to 80 percent below 1990 levels by 2050. The Governor issued Executive Order (EO) B-30-2015 that established the most ambitious greenhouse gas reduction target in North America and specified comprehensive steps for consideration of climate impacts, and EO B-32-2015 that directs several state agencies to improve freight efficiency, transition to zero-emission technologies, and increase competitiveness of California's freight system. Furthermore, the Federal Clean Air Act calls for an 80 percent reduction in NOx emissions by 2023.<sup>1</sup>

These investments are designed to inform near-term adoption and implementation of low carbon fuels and to address critical research needs not addressed in current research programs. The final research topics will be developed through engagement with other state agencies, the research community, and the public. The research project funding will be awarded via competitive solicitations and support research and pre-commercial development of low carbon alternative fuels, including but not limited to:

#### Low Carbon Fuel Research:

- Improving the economics of algae-based renewable diesel production
- Hydrogen production from renewable sources combined with fueling infrastructure and onsite storage for load and supply management
- Pathways for cost-effective development and implementation of low-carbon fuels, including innovative economic tools and accounting for multiple benefits and product development

The program could potentially also support other areas of research for advanced light-duty and sustainable freight technologies to further reduce petroleum use in the transportation sector. These additional topics will be vetted through a public comment process and include but are not limited to:

#### Light-Duty:

- Research on potential opportunities for low cost and efficient hydrogen onboard vehicle storage
- Development of advanced climate control systems (could also be applied in freight applications) to reduce fuel economy penalty

#### Sustainable Freight:

- Pilot demonstrations of integrated technologies and fuel and operations management for sustainable freight in select trade corridors (e.g., electric switcher cars)
- Maritime transportation and port operations - quantifying the needs, opportunities and benefits for reducing emissions and operating costs from maritime transportation. This could include liquefied natural gas bunkering and electrification of off-road equipment at ports.
- Hybridization for heavy-duty trucks

The Energy Commission requests authority for a two-year encumbrance period and an additional four years to expend these funds.

### B. Background/History

In January 2015, Governor Brown announced five pillars designed to reach the State's mid- and long-term greenhouse gas (GHG) emission reduction goals. One pillar is to reduce petroleum consumption 50 percent by 2030. California's on-road transportation system includes 170,000 miles of highways and major roadways, more than 26 million passenger vehicles and light trucks, and almost 1 million medium- and heavy-duty vehicles. The most recent data available (2012) shows the transportation

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<sup>1</sup> California Energy Commission. 2015. *2014 Integrated Energy Policy Report Update*. Publication Number: CEC-100-2014-001-CMF

## Analysis of Problem

sector emits 36 percent of the total greenhouse gases in the state and about 83 percent of smog-forming oxides of nitrogen (NOx).

California's transportation sector is the largest contributor of greenhouse gases of all the sectors captured in the greenhouse gas emissions inventory. Passenger vehicles (25.8 percent) and heavy-duty trucks (7.8 percent) represent the largest subsector contributors of the transportation sector. Recognizing the importance of greenhouse gas reductions from the transportation sector in the state's multi-pronged approach to addressing climate change, the State has authorized several programs and efforts administered by state agencies like the Energy Commission and Air Resources Board (ARB) to tackle transportation emissions and drive toward a zero-emission transportation system.

On July 17, 2015, Governor Brown issued Executive Order B-32-15 which directs the Secretary of the California State Transportation Agency, the Secretary of the California Environmental Protection Agency, and the Secretary of the Natural Resources Agency to lead other relevant State departments including the ARB, the California Department of Transportation, the Energy Commission, and the Governor's Office of Business and Economic Development to improve freight efficiency, transition to zero-emission technologies, and increase competitiveness of California's freight system. The Sustainable Freight Transport Initiative includes a directive to develop an integrated freight action plan by July 2016.

Additionally, the Governor issued EO B-30-15 establishing the most ambitious GHG reduction target in North America and specifying comprehensive steps for consideration of climate impacts. The EO requires all state agencies to consider the impacts of climate change in all planning and investment activities, including capital outlay projects.

While California continues to make good progress in these areas by doubling down on proven strategies and taking the lead on developing and implementing some "first-in-the-world" solutions, the magnitude of change needed to address the threats of climate change and meet more stringent federal air quality standards in the state will require even further innovation in the energy and transportation sectors.<sup>2</sup> Additionally, current programs leave critical gaps in transportation research needs.

### C. State Level Considerations

There are several programs and efforts administered by state agencies that support greenhouse gas emission reductions from the transportation sector. The Energy Commission-administered programs include the Natural Gas Research and Development (R&D) program, the Electric Program Investment Charge (EPIC) program, and the Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP). Each of these programs has a discrete role in the portfolio approach to reduce transportation's emissions, and each program has its limitations.

The Natural Gas R&D program supports technology improvements for natural gas vehicles and technological advancements for renewable natural gas production. Previously, legislation existed (Senate Bill 76, Committee on Budget and Fiscal Review, Statutes of 2005) that allowed the program to support advancements for alternative fuels, in addition to renewable natural gas. However, this provision expired in 2009. Furthermore, the projects supported by this program must have clear natural gas utility ratepayer benefits and demonstrations must be in investor owned utility territories.

Marine and aviation opportunities are not supported by this program because of the requirement for natural gas ratepayer benefits and emissions from the vessels and aircrafts are not fully accounted for in California's emissions inventories because of their out-of-state operations.

The EPIC program supports a variety of research, development, demonstration, and market facilitation efforts that benefit electric utility ratepayers. Strategic objectives are described in program investment plans and vetted through a public process. The strategic objectives are prioritized consistent with

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<sup>2</sup> California Energy Commission. 2015. *2014 Integrated Energy Policy Report Update*. Publication Number: CEC-100-2014-001-CMF

## Analysis of Problem

California's loading order: energy efficiency is the highest priority followed by renewable generation. The transportation-related strategic objectives receive a modest funding amount (~\$4 million for each triennial investment period), and to date, focus on grid integration and the benefits that the plug-in vehicles or their batteries can provide to the grid. Port operations and goods movement could benefit from fuel switching; however, non-electric fuel switching is not part of the EPIC program. EPIC demonstrations must also be located in electric investor-owned utility service territories, and that provision excludes demonstrations at several California ports.

The ARFVTP was established in 2007 to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change policies. The projects supported by the ARFVTP are estimated to reduce between 3.4 million and 5.3 million tonnes of carbon dioxide equivalent emissions annually and displace the equivalent of between 441 million and 693 million gallons of gasoline/diesel per year by 2025. The ARFVTP is primarily focused on deployment and commercialization of alternative fuels and vehicle technologies, whereas this proposal would research and develop pre-commercial technologies working towards a prototype suitable for large-scale demonstration by the ARFVTP.

The Energy Commission also has a pending Budget Change Proposal for \$25 million in Greenhouse Gas Reduction Funds (GGRF) that would focus on biofuel production. This GGRF program could include production incentives and would supplement the ARFVTP if approved. However, like the ARFVTP, the focus is on commercial-scale biofuel production and not on much-needed research to feed the innovation pipeline.

### D. Justification

The vast majority of domestic transportation and goods movement in California relies on petroleum fuel, which when combusted contributes to both local criteria air pollutants and climate-change greenhouse gases. A recent study by the Lawrence Berkeley National Laboratory estimated future GHG emissions in California taking into account climate policies adopted before 2014. The projections for 2030 and 2050 suggest that additional measures will be needed to achieve the 40 percent and 80 percent emission reduction goals by 2030 and 2050, respectively. By 2030, the GHG emission reductions from the baseline would be on the order of about 160 MTCO<sub>2</sub>e and about 370 MTCO<sub>2</sub>e by 2050. The transportation sector, as the major contributor to GHG emissions in California, will face most of the burden of the required GHG emission reductions.

Commercialization of the low carbon fuel production systems and advanced vehicle technologies that will yield such reductions comes with high capital costs and financial risk. However, as we observed with the complementary state-administered programs described above, there is interest from private companies, universities, research institutions, and utilities to bring the solutions when grant funding is made available.

This proposal gives California the opportunity to support cutting edge, pre-commercial technologies and approaches that are inherently financially risky and not amply supported by private investments.

California must commit resources to support more clean transportation solutions in order to achieve the ambitious emission reduction goals. There is a need to research the best suited and highest value low carbon fuels and vehicle technologies for each application, which may not be natural gas or electricity.

### E. Outcomes and Accountability

The requested one-time expenditure authority for \$15 million will be used to award grants and contracts to support research and development and demonstration projects focused in key areas that will assist the State in meeting its petroleum reduction goals.

The Energy Commission has established a series of oversight and coordination efforts that will ensure the outcomes are appropriate and the overall program has accountability via monthly and quarterly reporting requirements. As a result, there will be ongoing oversight and assessment regarding the

## Analysis of Problem

effectiveness of these program activities. The direction for the use of the program funds will be publically available in a published report.

- *What controls will be in place to ensure the appropriate use of the requested resources or authority?*

The Energy Commission will follow public resources statute requirements in the development, award and management of agreements funded with these one-time funds. The awarding of the funding will follow a public and transparent process including Energy Commission Business Meetings, Energy Commission Executive Office approval and other normal contract and grant award process oversight.

The Energy Commission has existing staff resources in place to ensure adherence with the State Procurement Policies, State Administrative Manual, and other applicable policies and procedures.

- *How will the requested resources be accounted for and monitored?*

Funding for this program will be managed by trained solicitation and agreement managers. Staff will follow the written procedures for review and approval of contractor invoices. Regular meetings will be held to monitor research progress. Additionally, the project plan will be developed through the Energy Commission public workshop process and agreements will be approved by the Energy Commission through a public process. Research projects will include tasks to perform a benefits analysis and technical transfer activities, and summarize the project, benefits and findings in a final project report that is published and available to the public via the Energy Commission website.

- *Will there be progress and/or outcome reports completed? If so, how often and to whom will they be distributed?*

Monthly or quarterly progress reports are mandatory for Energy Commission funded research. These reports will detail progress to-date, along with fiscal status and task deliverable status. A final report will be required at the conclusion of each funded project. The final report is reviewed by internal technical staff and management before publication on the Energy Commission's website. These reports are available to the public free of charge.

- *How will improvements or changes be measured?*

To ensure that research appropriate to this proposal is funded and conducted in keeping with the Energy Commission's research policies and goals, the Energy Research and Development Division will release a competitive solicitation in accordance with the State Procurement Policies and Energy Commission solicitation policy. Projects will be scored based on the strength of the project's team, technical merit and approach, match funds, and benefits to the state. Projects will be awarded and developed that include a detailed scope of work with tasks and deliverables, as well as a complete budget. Monthly or quarterly progress reports will be provided to the Energy Commission Project Manager to track the project's progress. Critical project reviews between Energy Commission staff and the project team will also be held at specific stages to measure how the project is progressing. The project agreements will contain a technology transfer and outreach section to ensure deliverables and products are distributed to the appropriate end users.

## F. Analysis of All Feasible Alternatives

### 1. Do Nothing

#### *Pro*

No appropriation needed for one-time expenditure authority.

#### *Con*

While there are other programs with goals to expand the use of alternative fuels and advanced vehicle technologies, critical gaps remain. The transportation sector poses extreme challenges to the climate change problem as the largest contributing sector to greenhouse gas emissions in California, and an equally strong showing of financial support is warranted to yield the reductions

## Analysis of Problem

needed to meet the State's goals. The proposed program will yield advancements in low carbon fuels and alternatives to petroleum fuels.

With this alternative, critical gaps remain that existing programs cannot address, leaving necessary GHG reductions unrealized.

### 2. Approve one-time expenditure authority to fund this proposal

#### Pro

Research to fill this knowledge gap will proceed and yield findings and results that will enable advanced, low carbon fuels with high value co-products and co-benefits to better compete with conventional petroleum fuels. The program is intended to accelerate development of these advanced fuels that will result in GHG emission reductions.

#### Con

There may be competing proposals for available General Funds.

## G. Implementation Plan

The Energy Commission will release a solicitation. In the creation of solicitation materials, the Energy Commission project manager will seek advice from relevant state agencies and key stakeholders. Proposals will be reviewed by a panel of subject matter experts and only the most qualified proposals will be recommended for funding. Projects will be considered for approval at an Energy Commission Business Meeting and grants will be executed for successful projects. Energy Commission staff will follow existing agreement management guidelines and ensure that standard tasks are completed successfully. The project manager will be responsible for coordinating with the recipient, providing project oversight, and serving as the Energy Commission's point of contact for stakeholders interested in receiving more information about the project. As part of the funding agreement, the recipient will be required to:

- Participate in critical project review meetings.
- Submit quarterly progress reports.
- Submit an annual report that describes, at a minimum:
  - A description of each project installed, with locational information and technical attributes.
  - The performance of each project, according to the metrics outlined below.

The Energy Commission will include measurement and verification activities in the agreement to evaluate the performance of the funded projects. These performance metrics would include but are not limited to the following:

- GHG reductions resulting from projects.
- GHG reductions per dollar invested.
- Air pollution reductions.
- Petroleum displaced.
- Description of project benefits to disadvantaged communities.

Energy Commission staff will report significant findings and successes with management and media. Energy Commission staff will also coordinate with managers of other state programs such as the ARFVTP and Low Carbon Fuel Standard to ensure results of this program are considered in current investment plans, fuel pathway documentation, and regulatory proceedings.

**H. Supplemental Information**

None

**I. Recommendation**

Approve \$15 million from the General Fund to support research, development and demonstrations to reduce petroleum use, drive greenhouse gas reductions, and improve air quality from California's transportation sector.